



## PATENT ABSTRACTS OF JAPAN

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**KAWAI KENJI****(54) MANUFACTURE OF SEMICONDUCTOR DEVICE****(57) Abstract**

**PURPOSE:** To prevent an isolation characteristic and an element characteristic from being spoiled even when impurities are introduced after a rounding oxidation operation by a method wherein an impurity-contained film is formed in a groove formed in an element isolation region in such a way that it is thick at the bottom and thin at sidewall parts and, in addition, impurities are diffused thermally into the substrate.

**CONSTITUTION:** A mask 2 is formed on a silicon substrate 1; a groove part 3 is formed in the substrate by a dry etching operation; in addition, a rounding oxidation operation is executed at a high temperature to form an oxide film. Then, this oxide film is removed. The groove part 3 is obtained; it is coated with a silanol compound solution SOG containing boron; after that, a heat treatment is executed; the SOG is transformed into a glass film 8; then, its film thickness becomes thinnest at sidewall parts and thicker in the order of the surface of the substrate 1 and the bottom of the groove part 3. In this state, the glass film 8 on the surface of the substrate 1 is removed; during this process, the glass film 8 at the bottom of the groove part is not removed and is left; another heat treatment is executed; impurities in the glass film 8 are diffused into the substrate 1; a channel cutting

region 4 is formed; after that, the glass film 8 in the groove is removed; an oxide film 5 is deposited and the groove part 3 is filled. Thereby, an isolation characteristic and an element characteristic which are good can be made compatible.

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